

SECTION 3

HOUSE AND INTERIOR BULKHEADS

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3.1 REFERENCES	
(3A) Code of Federal Regulations – 46 CFR Sub-chapter H	
(3B) Code of Federal Regulations – 46 CFR Sub-chapter I	
(3C) ABS Rules for Building and Classing Steel Vessels	
(3D) ABS Guide for Building and Classing Passenger Vessels	

1 (3E) ABS Guide for Passenger Comfort on Ships

2 (3F) ABS Guide for Crew Habitability on Ships

3 **3.2 INTRODUCTION**

4 This Section contains the Contractor Design and Provide general requirements for the
5 superstructure. For purposes of the Technical Specification, the superstructure shall include
6 all structure above the Lower Vehicle Deck (Main Deck), inclusive of the Machinery
7 Casings.

8 *For WSF Fleet-wide Standardization purposes, End No. 1 of the Vessel shall always be*
9 *considered the bow, and this designation shall delineate port and starboard, fore and aft*
10 *wherever they are addressed in the Technical Specification.*

11 **3.3 GENERAL**

12 For materials, workmanship, welding, integrity, fairness, straightness, alignment, and
13 inspection for structure and other details not provided within this Section of the Technical
14 Specification, see Section 2 of the Technical Specification, unless otherwise noted herein.

15 For definition of Weather Decks, see Section 2 of the Technical Specification.

16 Passenger spaces shall emphasize and afford an excellent view of the landscape.

17 The boundaries of all deckhouses shall be of watertight construction, except in way of doors
18 which shall be weathertight.

19 Painting is specified in Section 14 of the Technical Specification.

20 For additional details concerning the elevators, see Section 23 of the Technical Specification.

21 Outside corners shall be formed to a minimum six (6) inch radius, except as noted.

22 Where stainless steel bolting is used, the threads of all bolts shall be coated with an
23 appropriate anti-seize compound prior to assembly.

24 Steel bulkheads surrounding wet spaces shall be welded continuously on the wet side to no
25 less than four (4) inches above the deck.

26 Weather decks and bulkheads (as defined in the *GENERAL* Subsection in Section 2 of the
27 Technical Specification) and all interior steel decks, coamings and bulkheads in way of "wet"
28 spaces and refrigerated spaces shall be proven watertight prior to application of any deck or
29 bulkhead covering and after all preparatory Work comprising water-tightness has been
30 completed. "Wet spaces" include restrooms, toilets, washrooms, showers, Cleaning Gear

1 Lockers and Food Vending areas/spaces. Refer to Section 101 of the Technical Specification
2 for testing requirements.

3 Horizontal bulkhead stiffeners exposed to the weather, such as those installed in way of the
4 bridge wings, shall have two (2) inch radius limber holes cut at intersections to assure
5 drainage.

6 **ATTENTION:** *For WSF coating systems maintenance purposes, bulb flat stiffeners*
7 *shall be utilized in all locations exposed to weather (Weather Deck*
8 *areas).*

9 **3.4 STEEL DECKS, BULKHEADS AND HOUSES**

10 The decks, deckhouses, casings, curtain plates and divisional bulkheads shall be located and
11 constructed as determined by the Contractor's design. Enclosed spaces located on the Lower
12 Vehicle Deck and within the down flooding boundaries shall be watertight. All other
13 exterior bulkheads exposed to weather (as defined as weather decks in the *GENERAL*
14 Subsection in Section 2 of the Technical Specification) shall be weathertight.

15 **3.5 STAINLESS STEEL WET SPACES DECKS**

16 Looking to the projected 60 year life expectancy of these Vessels, and ongoing wasting of
17 deck and lower bulkhead plating in certain wet spaces, WSF will require upgrading of the
18 steel material in certain spaces. Spaces defined in **TABLE 3-1** below shall be provided with
19 a continuous Type 316L stainless steel deck, with twelve (12) inches Type 316L stainless
20 steel bulkhead risers up all perimeter bulkheads. The bottom fifteen (15) inches of all
21 stiffener welds shall be continuous.

22 The Contractor shall use the appropriate carbon-steel to stainless steel transition welding rod
23 at seams between carbon steel and the stainless steel.

24 Temporary clips and padeyes shall be removed and all welds ground smooth. All welds shall
25 be free of slag, spatter, overlaps, ridges, grooves, and undercuts.

TABLE 3-1		
STAINLESS STEEL DECK WITH RISER LOCATIONS		
SPACE	END, P/S	DECK
Men's Restroom	1, Port	Passenger
Women's Restroom	1, Stbd	Passenger
Unisex Restroom	1, Port	Passenger
Unisex Restroom	1, Port	Sun
Crew Shower	1, Port	Sun
Crew Head	1, Port	Sun
Staff Chief Engineer's S/R Restroom	1, Port	Sun
Crew Heads (2)	2, Stbd	Sun
Crew Showers (2)	2, Stbd	Sun
Unisex Restroom	2, Stbd	Sun
Master's S/R Restroom	1, Port	Navigation Bridge

3.6 INTERIOR STEEL BULKHEADS

- Outside corners of interior steel bulkheads shall have a minimum radius of three (3) inches.
- Longitudinal and transverse bulkheads shall be arranged in continuous vertical planes to the extent required to resist racking and vibration.
- The boundaries of gas- or odor-producing spaces shall be continuously welded and fume-tight. The periphery of divisional steel bulkheads having an "A" Class fire rating in accordance with USCG Regulations shall be continuously welded on at least one (1) side.

NOTE: For the purposes of WSF throughout the Technical Specification, "gas- or odor-producing spaces" are defined as all interior to the weather spaces which contain, or have the clear potential to contain items which will produce annoying or noxious odors to the Passengers or Crew. Examples of such spaces

include, but are not limited to, food vending, garbage storage areas, paint lockers, cleaning gear lockers, and restrooms.

Where interior bulkheads are required to be of steel, they shall be utilized as deck supports in lieu of pillars and stanchions whenever possible, with scantlings developed accordingly. Care shall be taken that bulkheads so used are well supported from below and the resulting reactions are carried down and distributed into the hull structure.

3.7 WELD MESH ENCLOSURES

Weld mesh enclosures shall be provided to separate the Anchor Winch area from surrounding areas, and to provide security for material contained therein. The enclosures shall be fabricated from 1" square mesh \times 0.177", Type 316 stainless steel weld mesh suitably framed as set forth in the *Passenger Railings* Subsection in Section 5 of the Technical Specification and stiffened with Schedule 40, galvanized pipe with 1" \times $\frac{3}{16}$ " Type 316L stainless steel clips. A door fabricated from the same material and with Type 316 or better stainless steel butt hinges, hasp, and handle shall be provided for each enclosure. WSF will supply standard padlocks for all such enclosures.

Unless otherwise noted, all weld mesh enclosure/bulkheads/railings shall be fabricated from 1" square mesh \times 0.177", Type 316 stainless steel weld mesh suitably framed and stiffened with Schedule 40, galvanized pipe with 1" \times $\frac{3}{16}$ " Type 316L stainless steel clips, suitably framed and supported.

Provide a weld mesh panel to rail clip fastener system (each bolt fastener consisting of one (1) bolt, two (2) flat washers, and one (1) lock nut) shall be Type 316 stainless steel with Nyloc type nuts). Maintain a 2½ inch clearance between the underside of the top rail and the upper side of the lower rail bordering the upper and lower edges of the screen panels. Maintain a ½ inch clearance between the screen panel and adjacent rails and stanchions.

See Section 4 and 5 of the Technical Specification for additional requirements for weld mesh doors.

The weld mesh panel assemblies shall be grit blasted to SSPC-SP 6 "*Commercial Blast Cleaning*", and coated the same as the surrounding structure as specified in Section 14 of the Technical Specification. ***Care shall be exercised during grit blasting to prevent heat deformation of the panels.*** Stainless steel bolting for attaching panels do not require painting.

NOTE: As a departure from the weld mesh division enclosures on other WSF Vessels, and to meet new USCG requirements, the division between the Rescue Boat Stations and adjoining spaces/areas (Vehicle Decks, Gear Lockers, etc.) shall be designed and provided as "A-0" Class fire boundaries. See the *RESCUE BOATS AND DAVITS* Subsection in Section 16 of the Technical Specification.

3.8 VENTILATION LOUVER ASSEMBLIES

All exterior ventilation louvers to/from the weather shall be designed and fabricated of Type 316L stainless steel with stainless steel hinges on one side to allow for ease of service. Coating system shall be as set forth in Section 14 of the Technical Specification with the addition of a hand stripe coat of the back sides of angles, edges of structural shapes, and areas that are incapable of being properly covered by using conventional or airless spray equipment. Insure that the minimum dry film thickness is obtained. All fasteners shall be Type 316 stainless steel.

3.9 BULWARKS

A steel bulwark shall be provided port and starboard on the forward End of the Lower Vehicle Deck Curtain Plate at No. 1 & No. 2 Ends. Chocks shall be recessed in the bulwark as applicable to the mooring arrangements.

The above mentioned bulwarks shall be determined by the Contractor's design, and fitted with angle bulwark cap and with thicker plate inserts in way of mooring fittings. Vehicle Deck bulwarks are to be forty-two (42) inches high and an extension of the Lower Vehicle Deck Curtain Plating. This bulwark provides a transition from the Curtain Plating to the overhanging Vessel Ends, and is a highly stressed area. Suitable reinforcing shall be required.

Four (4) inch high curbing shall be provided at Lower and Upper Vehicle Deck bulwarks and casings. See Section 5 of the Technical Specification.

Bulwarks shall incorporate freeing ports as set forth in the *CURBING* Subsection in Section 5 of the Technical Specification.

3.10 EXPOSED BRIDGE WINGS

Exposed Pilothouse bridge wings shall be provided for the port and starboard bridge wing observation stations at each End of the Vessel. Provide bridge wing railings as set forth in the *Navigation Bridge Deck Railings* Subsection in Section 5 of the Technical Specification. A lockable, hinged railing section, with stainless steel latch and hasp, shall be installed in the bulwark to provide access to the bridge deck maintenance platform required by the *BRIDGE DECK MAINTENANCE PLATFORMS* Subsection in this Section of the Technical Specification.

3.11 NAVIGATION BRIDGE DECK MAINTENANCE PLATFORMS

A twenty-four (24) inch wide maintenance platform, GS METAL Corp. Heavy Duty Grip Strut, "H" Series, or equal, steel walkway channel system shall be provided at the Navigation Bridge Deck level, forward of each Pilothouse. Access shall be provided to the platform

through a lockable, hinged railing section, with latch and hasp, shall be provided through each Pilothouse walkway railing. All hardware for the hinged railing sections shall be Type 316 or better stainless steel. WSF will supply WSF standard padlocks for all such hinged railing sections.

A storm rail type horizontal handrail, similar to that as set forth in the *Passenger Deck Maintenance Railings* Subsection in Section 5 of the Technical Specification shall be provided just below the windows above the entire maintenance platform.

A cable type horizontal lifeline system as set forth in the *SAFETY LINES AND FITTINGS* Subsection in Section 5 of the Technical Specification shall be provided.

3.12 NAVIGATION BRIDGE DECK CATWALKS

The Navigation Bridge Deck shall be a continuous deck level that includes forty-eight (48) inch wide catwalks with handrails between the *Pilothouse areas* and the *Crew Accommodation Block* at both Ends of the Vessel. The catwalks, with handrailings, shall be provided: 1). on centerline, 2). of a none continuous and removable design to allow for Vessel flex between the adjoining structures. These catwalks are a part of WSF Homeland Security measure to provide Vessel Crew unrestricted movement between both Pilothouses and points in between without descending to the Sun Deck level. See the *GRATINGS*, Subsection in Section 79 of the Technical Specification for additional grating requirements. See the *Navigation Bridge Deck Railings* Subsection in Section 5 of the Technical Specification for additional railing requirements.

3.13 SUN DECK PASSENGER LOUNGES

Scantlings for the Sun Deck Passenger Lounges shall be determined by the Contractor's design and shall be of steel construction. If the Contractor foresees difficulty maintaining fairness with steel construction, as set forth in the *FAIRNESS CRITERIA* Subsection in Section 2 of the Technical Specification, alternative methods of construction may be proposed. It is imperative that the Contractor maintain fairness as any material distortion over the Fairness Criteria limits will directly affect the windows' capability to maintain their watertight integrity. Alternate material and methodology of construction must be approved by the WSF Representative prior to construction.

For additional information on lounge windows, see Section 5 of the Technical Specification.

3.14 SUN DECK MAINTENANCE PLATFORMS

A twenty-four (24) inch wide maintenance platform, GS METAL Corp. Heavy Duty Grip Strut, "H" Series, or equal, steel walkway channel system shall be provided at the Sun Deck level, forward of each Passenger Lounge. Access shall be provided to the platform through a

lockable, hinged weld mesh gate in the deck safety railing system provided in the *Passenger Railings* Subsection in Section 5 of the Technical Specification.

A storm rail type horizontal handrail, similar to that as set forth in the *Passenger Deck Maintenance Railings* Subsection in Section 5 of the Technical Specification shall be provided just below the windows above the entire maintenance platform.

A cable type horizontal lifeline system and equipment as set forth in the *SAFETY LINES AND FITTINGS* Subsection in Section 5 of the Technical Specification shall be provided.

3.15 PASSENGER DECK MAINTENANCE WALKWAYS

A maintenance walkway, similar to current WSF ISSAQUAH Class Vessels, shall be provided at the Passenger Deck level, along the entire Port and Starboard length of each Passenger Lounge. Access shall be provided to the platform through a lockable, hinged weld mesh gate in the deck safety railing system provided in the *Passenger Railings* Subsection in Section 5 of the Technical Specification.

A storm rail type horizontal handrail, as set forth in the *Passenger Deck Maintenance Railings* Subsection in Section 5 of the Technical Specification shall be provided.

A cable type horizontal lifeline system and equipment as set forth in the *SAFETY LINES AND FITTINGS* Subsection in Section 5 of the Technical Specification shall be provided.

3.16 FUNNELS

The steel funnels (stacks) shall be shaped and located as determined by the Contractor's design. The structure shall be adequately supported during construction and welding sequenced to minimize distortion. Any such distortion shall be removed and weld joints ground to give all exterior surfaces a smooth and fair appearance.

3.17 TESTS, TRIALS AND INSPECTIONS

Tests and/or trials shall be in accordance with this Section and Section 101 of the Technical Specification.

Inspections shall be performed as defined in this Section and in Sections 1 and 2 of the Technical Specification.

3.18 PHASE II TECHNICAL PROPOSAL REQUIREMENTS

The following deliverables, in addition to others required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be submitted to the WSF Representative

1 for approval during the Phase II Technical Proposal stage of Work in accordance with the
2 requirements of Section 100 of the Technical Specification:

- 3 A. Preliminary Scantling Calculations
- 4 B. Racking Analysis
- 5 C. Longitudinal Strength Analysis, Above Main Deck
- 6 D. Upper Vehicle Deck Structure Analysis
- 7 E. Miscellaneous Structure Analysis

8 ***Preliminary Scantling Calculations*** - for typical structure shall be provided in accordance
9 with the following minimum design requirements matrix. Justification of other design
10 pressures and analysis methods must be submitted to the WSF Representative for approval
11 during the Phase II Technical Proposal stage of Work.

MINIMUM DESIGN REQUIREMENTS MATRIX		
Scantling	Design Pressure	Notes/Reference (Optional)
Lower Vehicle Deck	407 PSF *	ABS / direct calculations, long'l buckling
Lower Vehicle Deck Casing	781 PSF	ABS / long'l buckling / hull shear
Upper Vehicle Deck	192 PSF*	ABS / direct calculations, long'l buckling
Upper Vehicle Deck Casing	296 PSF	ABS / long'l buckling / hull shear
Vehicle Decks Curtain Plate		ABS / direct calculations, long'l buckling
<u>Curtain Framing</u>	315 PSF	
<u>Curtain Webs</u> (Lower)	256 PSF	(NOTE: Curtain Plate is ineffective for hull shear)
<u>Curtain Webs</u> (Upper)	253 PSF	
Passenger Deck (Interior)	100 PSF	ABS 5-7-2/11.5.1 / direct calcs, long'l buckling
Passenger Deck (Exterior)	192 PSF	ABS / direct calculations, long'l buckling
Passenger Deck Casing		ABS / direct calcs, long'l buckling / hull shear
<u>Curtain Framing</u>	315 PSF	
<u>Curtain Webs</u>	226 PSF	(NOTE: Curtain Plate is ineffective for hull shear)

MINIMUM DESIGN REQUIREMENTS MATRIX, cont'd		
Scantling	Design Pressure	Notes/Reference (Optional)
Passenger Deck Curtain	315 PSF	ABS / direct calculations, long'l buckling
Deckhouse Fronts (Passenger Deck, Sun Deck, Lounge, and Navigation Bridge Deck)	258 PSF	ABS / direct calculations
Sun Deck	169 PSF	ABS / direct calculations, long'l buckling
Deckhouse Curtain (Sun Deck House, Lounge, Bridge, and Stack Sides)	258 PSF	ABS / direct calculations, long'l buckling
Navigation Bridge Deck, Bridge Top, Sun Deck House Top, Elevator House Top, Stack House Top, and Stack Top	135 PSF	ABS / direct calculations, long'l buckling

* Concentrated vehicle loads & associate calculations shall also be provided as required by the *Upper Vehicle Deck Structure Analysis* Subsection in this Technical Specification.

The preliminary scantling calculations shall include:

- a. Scantling sizing for passenger deck and supporting structure shall be in accordance with Section 3-2-3 of Reference (3C) for plating, Section 3-2-7 of Reference (3C) for beams and Section 3-2-8 of Reference (3C) for pillars, girders and transverses.
- b. Passenger deck strength shall be verified using worst case longitudinal strength, superstructure racking, and modal vibration conditions included in the Vessel global structure analysis.
- c. Additional consideration shall be given to Passenger comfort and Crew habitability guidelines in accordance with References (3E) and (3F).

The preliminary scantling calculations shall be reviewed by ABS. A copy of the review shall be provided to the WSF Representative within twenty-four (24) hours of receipt by the Contractor for comment and direction.

Racking Analysis - The scantlings and racking strength of the Vessel's superstructure shall be confirmed by Finite Element Analysis (FEA) during the Phase II Technical Proposal stage of Work, using a combination of Vessel motion analysis and either 2-D or 3-D finite element

analysis methods. The procedures used shall be approved by ABS and WSF. The analysis shall include, as a minimum:

1. As documented in Reference (3D), the superstructure support structure is analyzed based on a maximum stability condition deck loading due to static forces on a roll angle of 30 degrees while the Vessel is balanced in still-water for the heeled condition. This condition is a guideline for vessels of unrestricted service and due to the amount of the Lower Vehicle Deck submerged in a 30 degree roll condition, a maximum angle equivalent to the immersion of the curtain plate opening above the Lower Vehicle Deck shall be used to determine superstructure racking strength.
2. An additional racking condition shall be analyzed which evaluates the superstructure racking strength when subjected to a docking fender impact event which results in plastic yielding of the local structure at point of impact. This condition does not evaluate the event resulting in substantial impact damage spreading beyond zones of impact. Impact location shall be selected to produce maximum racking acceleration of the superstructure.

The superstructure shall be included in the analyses and calculations required by Section 2 of the Technical Specification. Other calculations and/or analyses of the superstructure shall be provided during the Phase II Technical Proposal stage of Work as required by the Authoritative Agencies.

Longitudinal Strength Analysis - The superstructure shall be included in the longitudinal strength analysis required by Section 2 of the Technical Specification.

Upper Vehicle Deck Structure Analysis - In addition to standard ABS design head calculations, the Upper Vehicle Deck plating shall be designed to withstand rolling and stowed vehicle loads as discussed in ABS Rules Section 3-2-3/5.17. The intent of this requirement is to minimize plate dishing over the sixty (60) year service life.

The Upper Vehicle Decks shall be designed to accommodate cars and light trucks. Consideration shall be given to vehicles parked in close proximity to each other, resulting in combined concentrated wheel loadings. Deflections of supporting members shall be minimized within normal limits. Stresses shall not exceed the limits provided in ABS Rules Section 3-2-7, Table 2.

The Analysis shall include verification for scantling strength determined using expected vehicle wheel loads and tire footprints in accordance with Section 3-2-3/5.17 of Reference (3C).

Scantling sizing for Upper Vehicle Deck and supporting strength shall be in accordance with Section 3-2-3 of Reference (3C) for plating, Section 3-2-7 of Reference (3C) for beams and Section 3-2-8 of Reference (3C) for pillars, girders and transverses.

Upper Vehicle Deck structural strength shall be verified using worst case longitudinal strength, superstructure racking, and modal vibration conditions included in the Vessel global structural analysis.

The design car and light truck load for the Vessel shall be based upon vehicles weighing 300 pounds per foot of length, distributed on four (4) individual 32 psi tires. A vehicle length of 18'-5" (see the *Vehicle Decks Layout* Subsection in Section 1B of the Technical Specification) shall be used for determining maximum concentrated tire loads.

The following deliverables, in addition to other deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be provided during the Phase II Design stage of Work in accordance with the requirements of Section 100 of the Technical Specification:

A. Preliminary Scantling Plans - Superstructure (including decks, bulkheads, bulwarks & stiffeners)

B. Preliminary Scantling Calculations

Sections, structural details and preliminary scantling profile of the superstructure shall be provided on the drawings required by Sections 2 of the Technical Specification.

Miscellaneous Structure Analysis - Additional items requiring structural analysis are:

a. Structural and vibration analysis of masts. Mast scantlings shall be selected based on local strength criteria as well as overall racking, longitudinal strength and modal vibration analysis criteria.

b. Equipment foundations. In addition to equipment foundation strength criteria of individual equipment specifications, foundations shall be evaluated for local and global vibration analysis criteria.

c. Propulsion system structure. Structure integrating the Propulsion System to the Vessel's hull structure shall be analyzed for both strength and vibration criteria associated with each component of the Propulsion System.

3.19 PHASE III DETAIL DESIGN AND CONSTRUCTION REQUIREMENTS

The following deliverables, in addition to other deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be provided during the Phase III Detail Design stage of Work in accordance with the requirements of Section 100 of the Technical Specification:

A. Scantling Calculations

(END OF SECTION)